Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Pauli Paramagnetic Effects on the Vortices in Superconducting $TmNi_2B_2C$ L. DEBEER-SCHMITT, M.R. ESKILDSEN, University of Notre Dame, M. ICHIOKA, K. MACHIDA, Okayama University, Japan, N. JENKINS, University of Geneva, Switzerland, C.D. DEWHURST, Institut Laue-Langevin, France, S.L. BUD'KO, P.C. CANFIELD, Ames Laboratory and Iowa State University — The magnetic field distribution around the superconducting vortices in $TmNi_2B_2C$ in the paramagnetic phase above T_N was studied experimentally as well as theoretically. Using small-angle neutron scattering we imaged the vortex lattice (VL). Using the magnitude of the VL scattering vector, we obtain a direct measure of the magnetic induction, B, which is found to exceed $\mu_0 H$ at all fields up to H_{c2}. Measurements of the VL reflectivity yielded a form factor which remains essentially constant up to $\sim 0.6 H_{c2}$, above which it decreases rapidly but remains measurable up to the upper critical field. This field dependence of the form factor is in striking contrast to the usual exponential suppression. The measured form factor is well fitted by model based on the Eilenberger equations, extended to include paramagnetic effects due to the exchange interaction with the localized $4f$ Tm moments. The model shows how the induced paramagnetic moments around the vortex cores act to maintain the field contrast probed by the form factor. The results will be compared to our recent measurements of the VL form factor in $CeCoIn_5$, which also indicate strong paramagnetic effects.

Lisa DeBeer-Schmitt
University of Notre Dame

Date submitted: 03 Jan 2008 Electronic form version 1.4